

PROTECTING YOUR DRINKING WATER THROUGH WELLHEAD PROTECTION

A “HOW TO” WORKBOOK FOR SMALL WATER SYSTEMS

WORKBOOK FOR: _____

DATE: _____



ACKNOWLEDGEMENTS

This workbook could not have been developed without the interest, encouragement and active participation of the following:

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Judy Muehl, Pennsylvania Rural Water Association
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INTRODUCTION

This workbook was developed by Spotts, Stevens and McCoy, Inc. (Reading, Pennsylvania) as a result of the *Kutztown Area Wellhead Protection Program with Topton and Lyons Boroughs and Contiguous Areas* in eastern Berks County, Pennsylvania. The Kutztown Wellhead Protection project was funded by a USEPA Wellhead Protection Demonstration Program Grant.

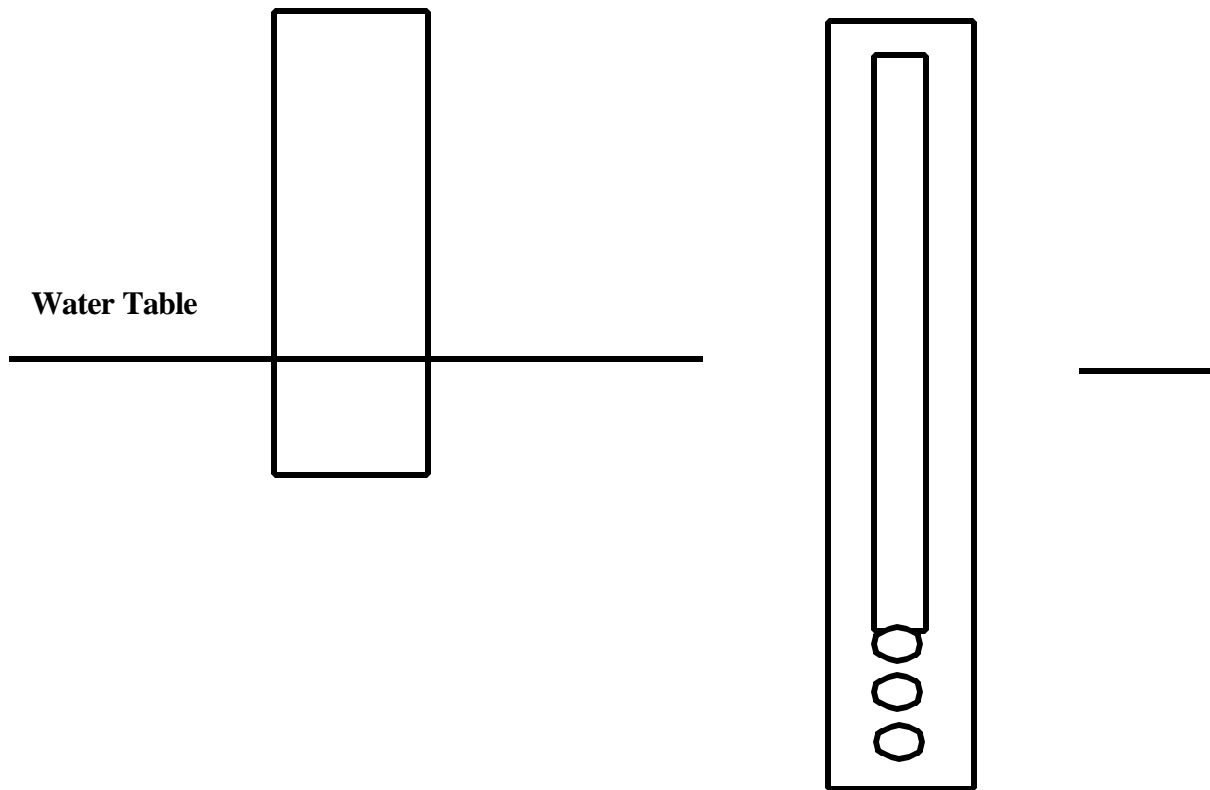
This workbook is meant to be a guide for small Pennsylvania water systems, with few or no financial resources, beginning a wellhead protection program, which may require a period of time to evolve. **This publication is meant as a workbook, it is meant for use to use, please write in it and mark it up.**

This workbook does not address groundwater fundamentals. For information on the basics of groundwater and more detailed information on wellhead protections, some valuable references are "Wellhead Protection: A Guide For Small Communities" (EPA February, 1993); "Wellhead Protection Workbook" (EPA Region III, January 1993); and "Groundwater: A Primer for Pennsylvanians" and "Groundwater Protection and Management in Pennsylvania: An Introductory Guide for Citizens and Local Officials" both from the League of Women Voters of Pennsylvania and Penn State Cooperative Extension. Information is also available through EPA's Safe Drinking Water Hotline: 800/426-4791.

**PROTECTING YOUR DRINKING WATER
THROUGH
WELLHEAD PROTECTION**

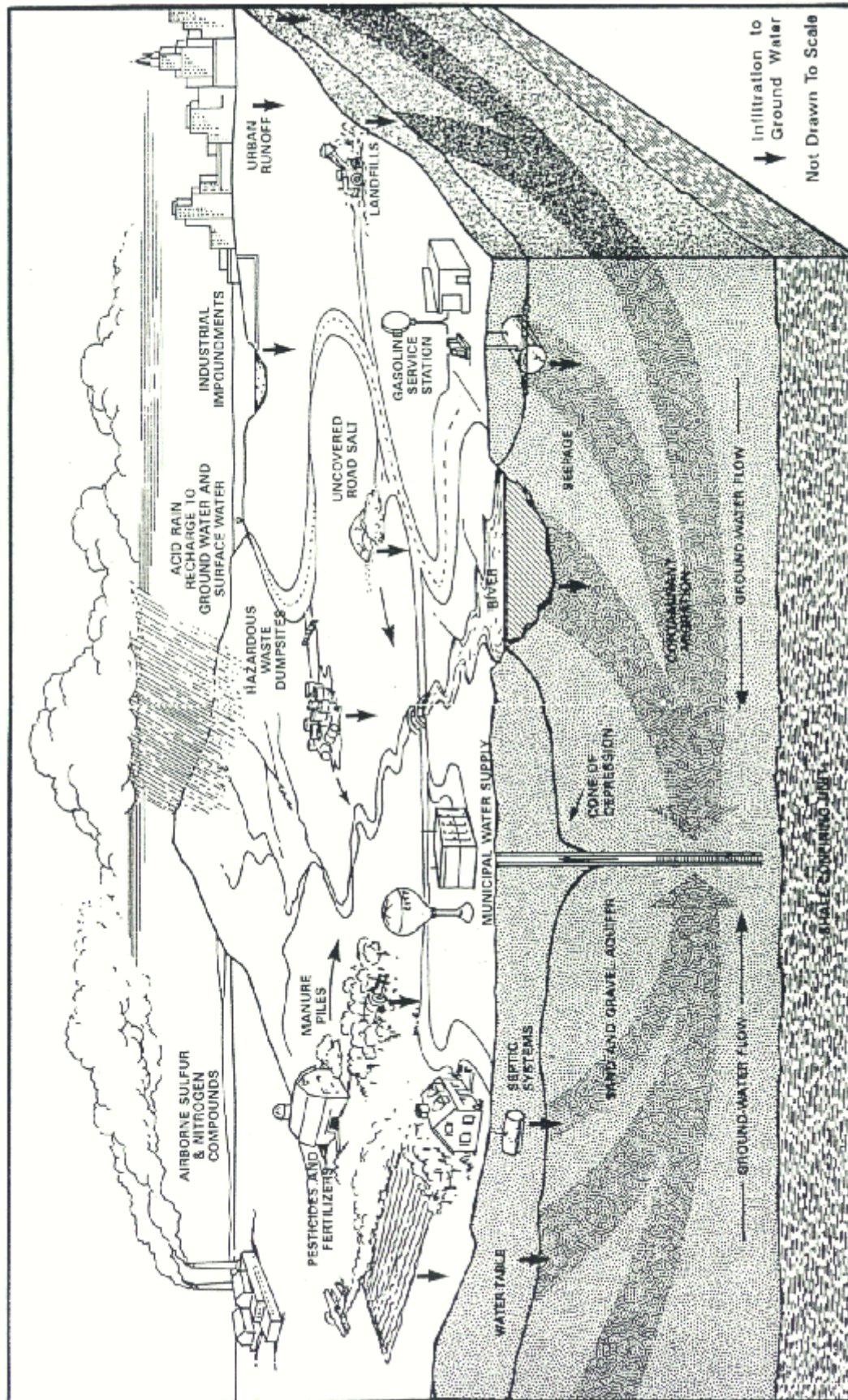
**A “HOW TO” WORKBOOK
FOR
Small Water Systems**

We've made progress with how we get water from the days of hand-dug wells to drilled wells of today.



**BUT, THE PROBLEMS WITH POTENTIAL CONTAMINATION OF
GROUNDWATER HAVE NOT GONE AWAY AND . . .
MAY IN FACT BE A GREATER THREAT NOW THEN IN THE PAST.**

Graphic: U.S. Environmental Protection Agency



**PROVIDER OR WATER USER ARE YOU INTERESTED IN
D ABOUT . . .**

	Yes	No
• SERVING GOOD QUALITY WATER	_____	_____
• RECEIVING GOOD QUALITY WATER	_____	_____
• PROTECTING YOUR WATER SUPPLY	_____	_____
• IDENTIFYING WHERE YOUR WATER SUPPLY COMES FROM	_____	_____
• KNOWING SOURCES OF POTENTIAL CONTAMINATION	_____	_____
• RECOGNIZING SOME MANAGEMENT TOOLS FOR A SMALL SYSTEM	_____	_____
• OTHER: _____	_____	_____

. . .AS THESE RELATE TO YOUR SYSTEM?

**IF YOU ANSWERED ANY OF THESE QUESTIONS WITH A
YES,
PLEASE READ ON.**

We're interested, but . . .

WHAT CAN WE DO?

WHAT SHOULD WE DO?

TO PROTECT THE GROUNDWATER WE USE FOR . . .

. . . drinking

. . . bathing

. . . cooking

. . . washing clothes

ONE APPROACH IS TO DEVELOP A . . .

WELLHEAD PROTECTION PLAN

HOW DO WE DO THIS?

q

THERE ARE FIVE BASIC STEPS TO WELLHEAD PROTECTION.

Step 1

***FORM A
COMMUNITY
PLANNING TEAM***

Step 2

***DEFINE THE
LAND AREA TO BE
PROTECTED***

Step 3

***IDENTIFY POTENTIAL
SOURCES OF
CONTAMINATION***

Step 4

***MANAGE THE
WELLHEAD
PROTECTION AREA***

Step 5

***PLAN FOR THE
FUTURE***

PUBLIC EDUCATION

COMPLETING THIS WORKBOOK WILL PUT YOU ON THE ROAD TO PROTECTING YOUR GROUNDWATER RESOURCES FOR YOURSELF AND FOR FUTURE GENERATIONS.

WHY NOT BEGIN NOW!



STEP 1: GETTING STARTED

ONCE THE NEED OR OPPORTUNITY IS SPELLED OUT, WHY DOESN'T SOMEONE DO SOMETHING ABOUT IT?

HOW ABOUT YOU?

When a need is seen, a few initial contacts and discussions can quickly locate others with similar interests. Using the following page, jot down names, phone numbers, and addresses of others you think may be interested in wellhead protection and protecting your groundwater and . . .

. . . CALL THEM NOW!

WHO DO YOU CALL?

Any number of people may be interested from . . .

- local government
- planning/ zoning
- state regulatory agencies
- water department
- agricultural community
- industry
- conservation/environmental groups
- schools
- civic/community organizations
- developers



VERY IMPORTANT:

If the well or wellfield for your water system is located in another municipality, it is essential you invite that municipality. Even if there has been little cooperation on other issues, a wellhead protection program will indirectly benefit individual well owners in that municipality as well as your water system.

INITIAL CONTACTS AND DISCUSSIONS



	WHO?	ORGANIZATION ADDRESS, PHONE, FAX AND EMAIL NUMBERS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

DEVELOP INTEREST

After making the initial telephone contacts, call an informal meeting of all interested parties. Make this a broad-ranging meeting which further develops interests in wellhead protection planning for your community.

Use the following page as a guide to organize your meeting.

SOME SUGGESTIONS FOR AGENDA ITEMS:

- Recent water quality problems
- Development in the area
- Potential contamination threats
- How to organize
- Sources of assistance
- What information do we have
- Who else might be interested
- Budget
- Assignments
- Staff capabilities

INFORMAL MEETING TO DETERMINE INTEREST

INTEREST! ENTHUSIASM!: CONTINUE WITH NEXT PAGE

NO INTEREST! APATHY!: GO TO PAGE 32

ORGANIZER: _____

WHO IS ATTENDING?

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

TIME/DATE _____

LOCATION _____

AGENDA ITEMS:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

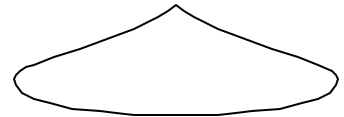
REFRESHMENTS: _____

ADDRESS THE BASIC ISSUES

If there is interest in wellhead protection, begin by discussing the basic issues. Don't get bogged down in details at this point. Several meetings may be needed as the idea of wellhead protection becomes more focused on your system's specific needs.

Remember that each situation will be different and has to deal with its own particular personalities, interests, problems, constraints, and opportunities. Take one step at a time. Don't try to solve all the issues at your first meeting.

**USE THE NEXT TWO PAGES
TO KEEP SIMPLE MINUTES
OF YOUR FIRST MEETING.**



DO WE NEED OUTSIDE RESOURCES?

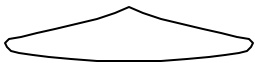
Possibly.

Experiences elsewhere have shown that wellhead protection planning must have a good technical and legal basis. There are many things your planning team can do, but two resources that can provide valuable assistance are a hydrogeologist to determine the wellhead area delineation and a lawyer to provide direction on the management tools. The lawyer will very likely be your municipality's solicitor. The hydrogeologist may be a consultant or from a local college or government agency.

MINUTES OF FIRST MEETING

KEY ITEMS DISCUSSED

OUR GOALS FOR SOURCE WATER PROTECTION



STEP 1: FORM A COMMUNITY PLANNING TEAM.

THINGS TO DO NEXT

WHAT?	WHO?	WHEN?

STEP 1: FORM A COMMUNITY PLANNING TEAM.

THE WHPP COMMITTEE MEMBERS ARE:

NAME	ADDRESS	PHONE/FAX/ EMAIL(W)/(H)	REPRESENTING

DEFINE THE WELLHEAD PROTECTION AREA

Wellhead Protection Areas (WHPA's) are defined in the 1986 Safe Drinking Water Act Amendments as:

“The surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water or wellfield.”

PENNSYLVANIA RECOMMENDS THREE ZONES TO DEFINE WHPA'S:

- Zone 1:** The protective radius around a well as determined by the pumping rate. In Pennsylvania most wells are likely to have a Zone 1 area with a radius of less than 400 feet.
- Zone 2:** The zone of contribution or contributory area of the aquifer based on a 10-year time of travel, or other appropriate definition depending on geologic setting.
- Zone 3:** The watershed drainage area that potentially contributes to the water supply.

Defining the WHPA is the key technical step in wellhead protection planning and should be based on a reasonably sound approach in the event of challenges to the area defined for wellhead protection. This is where a hydrogeologist can help you.

BASICS: TO BEGIN DEFINING THE WHPA

	YES	No
1. Do we have a U.S. Geological Survey (USGS) topographic map(s) that is likely to cover our area? If not, obtain one. (To buy maps look under Maps in the telephone book yellow pages; hunting and fishing stores may also have these.)	_____	_____
2. Is there a drawing showing the water system? Previous studies?	_____	_____
3. Do we have information such as the drilling logs or capacity of the well pump for the well(s)?	_____	_____
4. Is hydrogeologic information for our area available through the Pennsylvania Geologic Survey, Hydrogeology Investigation Section (717/787-5828); or a local college?	_____	_____
5. What will a hydrogeologist cost to define the WHPA?	_____	_____
6. Can we afford a hydrogeologist?	_____	_____
7. Do we have zoning maps and ordinances for the area likely to under consideration?	_____	_____

IF YOU ANSWERED YES TO QUESTIONS 3, 4, AND 6, COLLECT THE APPROPRIATE INFORMATION AND GO TO PAGE 18.

IF YOU ANSWERED NO TO EITHER QUESTIONS 3 OR 6, GO TO PAGE 19.

COMMENT:

Zone 2 is typically defined using computer models, of which there are several. One which has been used reasonably well in Pennsylvania is EPA's WHPA 2.1 which is available for about \$50 from the: International Groundwater Modeling Center; Institute for Groundwater Research and Education; Colorado School at Mines; Golden, CO 80401-1887 (303/273-3103) See the Appendix for more information on this.

Also, EPA Region III (Philadelphia) has occasionally held classes for local governments in the use of this model. Inquire at 215/597-2786.

Caution: This model may not be applicable to every hydrogeologic situation.

**IF WELL DATA AND FUNDS
for a hydrogeologist
ARE AVAILABLE . . .**

1. Collect all the well or related data.
2. Select and retain a hydrogeologist to perform the computer groundwater modeling. This person should have experience with public water supplies and WHP area delineations.
3. Obtain clear mylar drawing sheets from a drafting or artist's supply store. Place the mylar over the USGS map and trace Zones 1, 2, and 3 as defined by the model. This will be the foundation for your WHPA mapping.

THIS WILL PROVIDE YOU WITH THE BASIC MAPS, INCLUDING THE WHPA, WITH WHICH TO PROCEED TO STEP 3 ON PAGE 20.

** If more advanced mapping systems are available to you, by all means use them.*

IF FUNDS FOR PROFESSIONAL ASSISTANCE ARE NOT AVAILABLE, YOU CAN STILL DEVELOP A SIMPLIFIED WELLHEAD PROTECTION PROGRAM, ESPECIALLY FOR A VERY SMALL SYSTEM.

1. You can still establish Zone 1, as this is typically a selected setback distance to provide the most elementary protection. In Pennsylvania, this will be determined by the well pumping rate and is generally anticipated to be a 400-foot radius, or less, around each well.

This can be effective for direct physical threats to a well and for prevention of microbial contamination. The water supplier should own or control its area and prohibit potentially contaminating activities within this area.

2. You can check, with the owner's permission, nearby wells to see if there is an influence from the well(s) you are working with.
3. You can still identify potential sources of contamination within a reasonable distance of the well(s) under consideration.
4. This will give you the essentials of a very basic wellhead protection plan which can be built on in the future as resources become available to perform computer modeling.

ANOTHER POSSIBILITY:

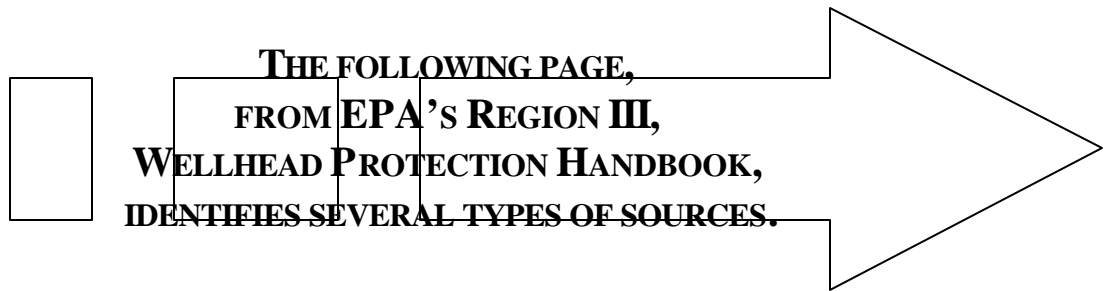
Someone in the group may be proficient with computers and willing to learn how to use the EPA model.

CAUTION: Although the WHPA code is user-friendly and someone who is computer literate could learn it quickly, there are some hydrogeological assumptions involved in using the models and sometimes estimates of aquifer properties must be made or extracted from the appropriate literature.

HOW TO: IDENTIFY POTENTIAL SOURCES OF CONTAMINATION

Once the WHPA has been identified, the next step is to identify potential sources of contamination. Remember, these are potential threats to water quality. Whether a potential threat becomes an actual one is determined in part by the type of activity, whether it enters the groundwater and its concentration and duration.

There are many potential sources of groundwater contamination, including many routine activities that we may not necessarily think of as being possible sources of contamination.



STEP 3: IDENTIFY POTENTIAL SOURCES OF CONTAMINATION.

**TABLE 1 - COMMON SOURCES OF
GROUNDWATER CONTAMINATION**

Animal burial areas Animal feedlots Chemical storage areas	Irrigation Manure spreading and pesticides Pesticides and fertilizers
Airport Auto repair shops Boat yards Construction areas Car washes Cemeteries Dry cleaning establishments Gas stations Golf courses (chemical application) Jewelry and metal plating Laundromats	Medical institutions Paint shops Photography establishments/printers Railroad tracks and yards/maintenance Research laboratories Road deicing operations (e.g. road salt) Scrap and junkyards Storage tanks and pipes (i.e. above-ground, below ground, underground)
Asphalt plants Chemical manufacture, warehousing, and distribution activities Electrical and electronic products and manufacturing Electroplaters and metal fabricators Foundries Fire training facilities Machine and metal working shops Manufacturing and distribution sites for cleaning supplies Mining (surface and underground) and mine drainage	Petroleum products production, storage and distribution centers Pipelines (e.g., oil, gas, coal, slurry) Septage lagoons and sludge Storage tanks (i.e. above-ground, below-ground, underground) Toxic and hazardous spills Wells - operating and abandoned (e.g., oil, gas, water supply, injection, monitoring, and exploration) Wood preserving facilities
Fuel storage systems Furniture and wood strippers and refinishers Household hazardous products Residential lawns (chemical application)	Septic systems, cesspools, water softeners Sewer lines Swimming pools (e.g., chlorine)
Hazardous waste management units (e.g., landfills, land treatment areas, surface impoundments, waste piles, incinerators, treatment tanks) Municipal incinerators Municipal landfills	Municipal wastewater and sewer lines Open burning sites Recycling and reduction facilities Stormwater drains, retention basins, transfer stations

PREPARING YOUR INVENTORY

THERE ARE THREE LIKELY SOURCES OF INFORMATION, TO BEGIN THE INVENTORY FOR YOUR WHPA.

1. CONTACT THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) FOR SOURCES SUBJECT TO CERTAIN FEDERAL AND STATE LAWS.

This may require contacting a number of different programs within DEP as well as individuals time to review DEP's files.

2. UTILIZE A DATA SERVICE

There are a number of data services who compile information on facilities and sources where environmental problems have occurred or are subject to certain federal and state laws. These services can provide an extensive amount of data including maps, usually within 7 to 10 days of a request. The cost of these services typically ranges from \$300 to \$500 depending on the amount and type of data requested.

3. YOUR PLANNING COMMITTEE (AND OTHER HELPERS)

Even if you contact DEP or a data service for assistance, these organizations will only be able to provide you with those sources where a problem has occurred or are subject to federal and state laws. There are many local activities you will have to identify yourself; for example, cemeteries. In addition to your committee, other organizations may be interested in assisting with the inventory. In other areas, senior citizen, civic, and environmental groups have helped prepare these inventories.

No special training is required. What is needed is enthusiasm, common sense and some general direction as to what to look for, such as the activities on the next page.

Using a copy of your USGS map (either buy extra copies or make photo-copies), draw your WHPA on the map and using the inventory sheet on the next page, prepare an inventory for your area. Use a separate sheet to organize names, addresses, and phone numbers, where you can obtain these.

Once you have this field information, use the same labeling system and transfer it to a second sheet of mylar placed over the one with the WHPA defined.

STEP 3: IDENTIFY POTENTIAL SOURCES OF CONTAMINATION.

**WELLHEAD PROTECTION PROGRAM
INVENTORY OF POTENTIAL CONTAMINATION SOURCES**

Directions: Place an "X" next to each category that you identify in the wellhead protection area. Place the corresponding number on the map at the location of the source. If there more than one source for a category, label each site with the number and a letter (e.g., multiple cemeteries would be 7A, 7B, 7C, etc.)



- | | | |
|----|--------------------------|--|
| 1. | <input type="checkbox"/> | Abandoned well |
| | <input type="checkbox"/> | 2. Above-ground storage tank |
| | <input type="checkbox"/> | 3. Airport |
| | <input type="checkbox"/> | 4. Animal feedlot/waste storage |
| | <input type="checkbox"/> | 5. Asphalt plant |
| | <input type="checkbox"/> | 6. Auto repair/body shop/salvage washes |
| | <input type="checkbox"/> | 7. Cemetery |
| | <input type="checkbox"/> | 8. Chemical production/mixing/storage |
| | <input type="checkbox"/> | 9. Dry cleaners |
| | <input type="checkbox"/> | 10. Electroplaters/metal finishers |
| | <input type="checkbox"/> | 11. Farm/private dumps |
| | <input type="checkbox"/> | 12. Fertilizer/pesticide storage/production/mixing |
| | <input type="checkbox"/> | 13. Holding pond/lagoon |
| | <input type="checkbox"/> | 14. Injection well |
| | <input type="checkbox"/> | 15. Irrigation practices |
| | <input type="checkbox"/> | 16. Laboratories |
| | <input type="checkbox"/> | 17. Machine shop |
| | <input type="checkbox"/> | 18. Mining (Quarry) |
| | <input type="checkbox"/> | 19. Golf courses/nurseries |
| | <input type="checkbox"/> | 20. Oil/gas/pipelines |
| | <input type="checkbox"/> | 21. Photo processors |
| | <input type="checkbox"/> | 22. Printers |
| | <input type="checkbox"/> | 23. Refinishing |
| | <input type="checkbox"/> | 24. Road salt storage |
| | <input type="checkbox"/> | 25. Septic systems |
| | <input type="checkbox"/> | 26. Service/gas stations |
| | <input type="checkbox"/> | 27. Sewage plant |
| | <input type="checkbox"/> | 28. Underground-storage tank |
| | <input type="checkbox"/> | 29. Waste piles |
| | <input type="checkbox"/> | 30. Wood preserving |
| | <input type="checkbox"/> | 31. Other (specify) |

Modified from an inventory sheet prepared by the Wisconsin Rural Water Association.

MANAGING THE WELLHEAD PROTECTION AREA

Up to this point you have collected or created a lot of information. In this step, you determine how you will use this information. You will likely need the advice and assistance of your attorney. You may also find the assistance of other professionals, such as planners, is very useful.

You will basically be making a decision about how to proceed with protecting the wellhead area in this step. This decision may range from "Do Nothing" to a very aggressive protection program, as well as many variations in between.

TYPICAL MANAGEMENT TOOLS FOR WELLHEAD PROTECTION

fall into four options:

- **REGULATORY**
 - 1. Health
 - 2. Zoning
 - 3. Subdivision control
- **NON-REGULATORY**
 - 4. Voluntary
 - Education
 - Monitoring
 - Adopting best management practices
 - Land acquisition
- **CERTAIN LEGISLATIVE TOOLS MAY ALSO BE AVAILABLE**

A table summarizing these tools, taken from EPA's "Wellhead Protection Communities," is located in the appendix. Detailed discussions on the document and EPA Region III's "Wellhead Protection Workbook."

SELECTION OF APPROPRIATE MANAGEMENT TOOLS FOR YOUR COMMUNITY SHOULD BE BASED UPON SPECIFIC SITUATIONS INCLUDING HYDROGEOLOGIC SETTING, POLITICAL SITUATION, RELATIONS WITH OTHER POTENTIALLY INVOLVED MUNICIPALITIES, AND LEVEL OF INTEREST.

SUGGESTION:

For small water systems, one management tool to consider that may involve the least disruption and be simpler to implement and be accepted is the concept of overlay zoning.

OVERLAY ZONING:

- Accepts current zoning that may already exist.
- “Overlays” the WHPA on top of the existing zoning
- Recognizes existing activities of the existing zoning.
- Recognizes existing activities that could impact on wellhead protection but with a minimum of disruption to them.
- Prohibits or provides certain controls on future activities that can affect wellhead protection.

MANAGEMENT TOOLS

IF YOU CONSIDER OVERLAY ZONING FOR YOUR SYSTEM :

COMPARE CURRENT ZONING AND PLANNING DOCUMENTS TO THE **WHPA** YOU HAVE MAPPED. AS A RESULT OF THIS COMPARISON, IDENTIFY:
(NOTE, SEE EXAMPLE IN APPENDIX)

· CURRENT ZONING OF CONCERN TO WELLHEAD PROTECTION:

· USES OR CONCERN TO **WHP** THAT ARE ALLOWED BY CURRENT ZONING:

· SPECIFIC PROVISIONS OF CURRENT ZONING THAT MAY TOUCH ON **WHP** ISSUES :

MANAGEMENT TOOLS

KEY ELEMENTS OF OVERLAY ZONING:

1. Define regulated land uses
2. Define regulated substances
3. Variances for existing uses/activities
4. Special exceptions for new sources
5. Consider requirements for design standards
6. Consider requirements for operating permits

Samples of these and other types of wellhead protection ordinances may be obtained from:

Pennsylvania Department of Environmental Protection
Bureau of Water Supplies and Community Health
Division of Drinking Water Management
PO Box 8467, 400 Market Street
Harrisburg, PA 17105-8467
717/772-4018

U.S. EPA Region III
Ms. Virginia Thompson, Mr. Dale Long, or Ms. Barbara Smith
Ground Water Protection Section (3 WM 42)
Water Management Division
841 Chestnut Street
Philadelphia, PA 19107
215/597-2786

REVIEW YOUR WELLHEAD PROTECTION PLAN YEARLY

This will allow you to

- Keep up-to-date on regulations.
- Review trends and activities in the WHPA
- Act on new information about potential contaminant sources

NEXT MEETING:

Date: _____

Time: _____

Place: _____

IDENTIFY FUTURE WATER SUPPLY WELL AREAS AND TAKE ACTION TO INCLUDE THEM IN YOUR WELLHEAD PROTECTION PLANNING.

Possible areas to be considered are: _____

DEVELOP A CONTINGENCY PLAN TO:

- **Provide for alternate water supplies should yours become contaminated.**

Some sources of possible assistance are:

Pennsylvania Department of Environmental Protection

Bureau of Water Supply and Community Health

Technical Assistance Center for Small Water Systems

717/787-0125

Pennsylvania Emergency Management Administration

717/783-8150

- **Deal with hazardous materials accidents and spills.**

A good place to start is with your community or county hazardous materials (HAZMAT) response coordinator.

Community/county HAZMAT coordinator: _____

Telephone Number: _____

NOTES ON HAZARDOUS MATERIALS RESPONSE

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

PUBLIC EDUCATION

A key part of wellhead protection is educating the public about the program. When people think about water, most think only in terms of what comes out of the tap.

They realize that the same areas in which they live, work, and play are frequently connected to the water they drink and use.

Even a modest public education program can help people gain a greater appreciation for your wellhead protection program. Remember, the cost of a potentially low-cost protection program can be much less than the cost of a new well or an air stripper.

Public education is critical to a successful program and should be started at the very beginning of a WHP program and should be an on-going activity throughout the planning and should continue as part of a long-range program.

SOME ACTIVITIES ARE:

- Providing signs along roadways and in housing areas to identify WHPA's (PennDOT can help along state highways)

- Conduct public meetings

Time: _____

Date: _____

Speaker: _____

- Provide speakers for civic/community groups:
Possible groups to speak to are:

- Provide newsletters or water bill inserts about the program.

PUBLIC EDUCATION

- Request coverage with your local newspaper and other media.

Newspaper

Contact: _____

Phone Number: _____

Radio

Contact: _____

Phone Number: _____

Television

Contact: _____

Phone Number: _____

- Contact your school district to determine interest in participating in activities related to wellhead protection.

For example:

- Participating in any Earth Day or scheduled environmental activity
- Designing a slogan or logo for the WHPA
- Art or essay contests related to water resource protection

You can get started by answering a few simple questions

Your School District: _____

Contact Person: _____

Phone Number: _____

Areas of Interest: _____

WHAT IF THERE IS LITTLE INTEREST?

DON'T STOP!

Find out why others don't see a benefit. Understand the "cost" of an unprotected wellhead.

Some possibilities are listed on the next page. Participants frustrated because every

What are the problems you are running into? List them and then try to find ways to overcome them.

Many people still live with the misconception that they won't get sick from the water. This is not true today -- population growth, more intense use of the land, and increased use of chemicals threaten most water supplies.

public cooperation. Do they

have the wrong issues? Are the

age and then try to find ways to

didn't get sick from the water, more intense use of the land,

Some of the costs of contaminated water can include cost to clean-up the water, adverse health effects, extra monitoring costs, treatment costs, and finding a new source of supply.

LACK OF UNDERS TANDIN G OF THE SDWA

- ☐ LEGAL COSTS
- ☐ ECONOMIC COSTS
- ☐ LACK OF INFORMATION
- ☐ COSTS TOO HIGH
- ☐ TIMING WRONG
- ☐ GROUP TOO LARGE
- ☐ GROUP TOO SMALL
- ☐ MUNICIPAL DIFFERENCES
- ☐ OTHER: _____

LOOK FOR POSSIBLE SOLUTIONS TO CREATE INTEREST

Look for ways to eliminate barriers and create interest in wellhead protection efforts and list them on the next page. These will vary from situation to situation depending on the barriers encountered. Two typical problems can be "cost" of developing a wellhead protection program and in many cases, the required cooperation when more than one municipality must be involved.

When the costs of cleaning up a contaminated water service are understood, the barrier should disappear. The wells for one municipality's water system may be located in a second municipality and the area to be protected may be in yet a third municipality. Once the second (and third) municipalities understand that a protection program would benefit their citizens with private wells, cooperation may improve.

Once you have identified ways to overcome the barriers, list the actions needed to make it happen. Don't forget to select a specific person who will be responsible for each step of your plan.

As problems are overcome and interest is developed, go back to page 11 to continue with the planning to protect drinking water in your area.

Remember, the cost of wellhead protection is cheap compare to the many costs (such as those listed on page 32) of coping with a source once it is contaminated.

STEP 5: PLAN FOR THE FUTURE.

Possible Ways To Eliminate Barriers And Create Interest	Actions Required To Make It Happen Solutions	Who is in Charge?
1.	1A. 1B. 1C.	1A. 1B. 1C.
2.	2A. 2B. 2C.	2A. 2B. 2C.
3.	3A. 3B. 3C.	3A. 3B. 3C.
4.	4A. 4B. 4C.	4A. 4B. 4C.
5.	5A. 5B. 5C.	5A. 5B. 5C.

APPENDIX A SUMMARY OF WELLHEAD PROTECTION TOOLS (FROM EPA'S "WELLHEAD PROTECTION: A GUIDE FOR SMALL COMMUNITIES.")

	Applicability to Wellhead Protection	Land Use Practice	Legal Considerations	Administrative Considerations
Regulatory: Zoning Overlay GW Protection Districts	Used to map wellhead protection area (WHPAs). Provides for identification of sensitive areas for protection. Used in conjunction with other tools that follow.	Community identifies WHPAs on practical base/zoning map.	Well-accepted method of identifying sensitive areas. May face legal challenges if WHPA boundaries are based solely on arbitrary delineation.	Requires staff to develop overlay map. Inherent nature of zoning provides "grandfather" protection to pre-existing uses and structures.
Prohibition of Various Land Uses	Used within mapped WHPAs to prohibit ground water contaminants and uses that generate contaminants.	Community adopts prohibited uses list within their zoning ordinance.	Well-organized function of zoning. Appropriate techniques to protect natural resources from contamination.	Requires amendment to zoning ordinance. Requires enforcement by both visual inspection and onsite investigations.
Special Permitting	Used to restrict uses within WHPAs that may cause ground water contamination if left unregulated.	Community adopts special permit "thresholds" for various uses and structures within WHPAs. Community grants special permits for "threshold" uses only if ground water quality will not be compromised.	Well-organized method of segregating land uses within critical resource areas such as WHPAs. Requires case-by-case analysis to ensure equal treatment of applicants.	Requires detailed understanding of WHPA sensitivity by local permit granting authority. Requires enforcement of special permit requirements and onsite investigations.
Large-Lot Zoning	Used to reduce impacts of residential development by limiting numbers of units within WHPAs.	Community "down zones" to increase minimum acreage needed for residential development.	Well-recognized prerogative of local government. Requires rational connection between minimum lot size selected and resource protection goals. Arbitrary large lot zones have been struck down without logical connection to Master Plan or WHPA program.	Requires amendment to zoning ordinance.
Transfer of Development Rights	Used to transfer development from WHPAs to locations outside WHPAs.	Community offers transfer option within zoning ordinance. Community identifies areas where development is to be transferred "from" and "to."	Accepted land use planning tool.	Cumbersome administrative requirements. Not well suited for small communities without significant administrative resources.
Cluster/PUD Design	Used to guide residential development outside of WHPAs. Allows for "point source" discharges that are more easily monitored.	Community offers cluster/PUD as development option within zoning ordinance. Community identifies areas where cluster/PUD is allowed (i.e., within WHPAs).	Well-accepted option for residential land development.	Slightly more complicated to administer than traditional "grid" subdivision. Enforcement/inspection requirements are similar to "grid" subdivision.
Growth Controls/Timing	Used to time the occurrence of development within WHPAs. Allows communities the opportunity to plan for wellhead delineation and protection.	Community imposes growth controls in the form of building caps, subdivision phasing, or other limitation tied to planning concerns.	Well-accepted option for communities facing development pressures within sensitive resource areas. Growth controls may be challenged if they are imposed without a rational connection to the resource being protected.	Generally complicated administrative process. Requires administrative staff to issue permits and enforcement growth control ordinances.
Toxic and Hazardous Materials Handling Requirements	Applicability to Wellhead Protection Used to ensure proper handling and disposal of toxic materials/waste.	Land Use Practice Community adopts health/zoning ordinance requiring registration and inspection of all businesses within WHPA using toxic/hazardous materials above certain quantities.	Legal Considerations Well accepted as within purview of government to ensure protection of ground water.	Administrative Considerations Requires administrative support and review of applications.

Private Well Protection	Used to protect private onsite water supply wells.	Community adopts health/zoning ordinance to require permits for new private wells and to ensure appropriate well-to-septic-system setbacks. Also requires pump and water quality testing.	Well accepted as within purview of government to ensure protection of ground water.	Requires administrative support and review of applications.
Non-regulatory: Land Transfer and Voluntary Restrictions				
Sale/Donation	Land acquired by a community with WHPAs, either by purchase or donation. Provides broad protection to the ground water supply.	As non-regulatory technique, communities generally work in partnership with non-profit land conservation organizations.	There are many legal consequences of accepting land for donation or sale from the private sector, mostly involving liability.	There are few administrative requirements involved in accepting donations or sales of land from the private sector. Administrative requirements for maintenance of land accepted or purchased may be substantial, particularly if the community does not have a program for open space management.
Conservation Easements	Can be used to limit development within WHPAs.	Similar to sales/donations, conservation easements are generally obtained with the assistance of non-profit and conservation organization.	Same as above.	Same as above.
Limited Development	As the title implies, the technique limits development to portions of a land parcel outside of WHPAs.	Land development work with community as part of a cluster/PUD to develop limited portions of a site and restrict other portions, particularly those within WHPAs.	Similar to those noted in cluster/PUD under zoning.	Similar to those noted in cluster/PUD under zoning.
Non-regulatory: Other				
Monitoring	Used to monitor ground water quality within WHPAs.	Communities establish ground water monitoring program within WHPA. Communities require developers within WHPAs to monitor ground water quality downgradient from their development.	Accepted method of ensuring ground water quality.	Requires moderate administrative staffing to ensure routine sampling and response if sampling indicates contamination.
Contingency Plans	Used to ensure appropriate response in cases of contaminant release or other emergencies within WHPAs.	Community prepares a contingency plan involving wide range of municipal/county officials.	None.	Requires significant up-front planning to anticipate and be prepared for emergencies.
Performance Standards	Applicability to Wellhead Protection Used to regulate development within WHPAs by enforcing predetermined standards for water quality. Allows for aggressive protection of WHPAs by limiting development within WHPAs to an accepted level.	Land Use Practice Community identifies WHPAs and established "thresholds" for water quality.	Legal Considerations Adoption of specific WHPA performance standards requires sound technical support. Performance standards must be enforced on a case-by-case basis.	Administrative Considerations Complex administrative requirements to evaluate impacts of land development within WHPAs.
Regulatory: Subdivision Control				
Drainage Requirements	Used to ensure that subdivision road drainage is directed outside of WHPAs. Used to employ	Community adopts stringent subdivision rules and regulations to regulate road	Well-accepted purpose of subdivision control.	Requires moderate level of inspection and enforcement by administrative staff.

	advanced engineering designs of subdivision roads within WHPAs.	drainage/runoff in subdivisions within WHPAs.		
Regulatory: Health Requirements				
Underground Fuel Storage Systems	Used to prohibit underground fuel storage systems (USTs) within WHPAs/ Used to regulate USTs within WHPAs.	Community adopts health/zoning ordinance prohibiting USTs within WHPAs. Community adopts special permit or performance standards for use of USTs within WHPAs.	Well-accepted regulatory option for local government.	Prohibition of USTs require little administrative support. Regulating USTs requires moderate amounts of administrative support for inspection follow-up and enforcement.
Privately Owned Wastewater Treatment Plants (Small Sewage Treatment Plants)	Used to prohibit small sewage treatment plants (SSTP) within WHPAs.	Community adopts health/zoning ordinance within WHPAs. Community adopts special permit or performance standards for use of SSTPs within WHPAs.	Well-accepted regulatory option for local government.	Prohibition of SSTPs require little administrative supports. Regulating USTs requires moderate amounts of administrative support for inspection follow-up and enforcement.
Septic Cleaner Ban	Used to prohibit the application of certain solvent septic cleaners, a known ground water contaminant within WHPAs.	Community adopts health/zoning ordinance prohibiting the use of septic cleaners containing 1,1,1-trichloroethane or other solvent compounds within WHPAs.	Well-accepted method of protecting ground water quality.	Difficult to enforce even with sufficient administrative support.
Septic System Upgrades	Used to require periodic inspection and upgrading of septic systems.	Community adopts health/zoning ordinance requiring inspection and if necessary, upgrading of septic systems on a time basis (e.g., every 2 years) or upon title/property transfer.	Well-accepted purview of government to ensure protection of ground water.	Significant administrative resources required for this option.
Hazardous Waste Collection	Applicability to Wellhead Protection Used to reduce accumulation of hazardous materials within WHPAs and the community at large.	Land Use Practice Communities in cooperation with the state, regional planning commission, or other entity, sponsor a "hazardous waste collection day" several times a year.	Legal Considerations There are several legal issues raised by the collection, transport, and disposal of hazardous waste.	Administrative Considerations Hazardous waste collection programs are generally sponsored by government agencies, but administered by a private contractor.
Public Education	Used to inform community residents of the connection between land use within WHPAs and drinking water quality.	Communities can employ a variety of public education techniques ranging from brochures detailing their WHPA program, to seminars, to involvement in events such as hazardous waste collection days.	No outstanding legal considerations.	Requires some degree of administrative support for programs such as brochure mailing to more intensive support for seminars and hazardous waste collection days.
Legislative:				
Regional WHPA Districts	Used to protect regional aquifer systems by establishing new legislative districts that often transcend existing corporate boundaries.	Requires state legislative action to create a new legislative authority.	Well-accepted method of protecting regional ground water resources.	Administrative requirements will vary depending on the goal of the regional district. Mapping of the regional WHPAs requires moderate administrative support, while creating land use controls within

Land Banking	Used to acquire and protect land within WHPAs.	Land banks are usually accomplished with a transfer tax established by state government empowering local government to impose a tax on the transfer of land from one party to another.	Land banks can be subject to legal challenge as an unjust tax, but have been accepted as a legitimate method of raising revenue for resource protection.	the WHPA will require significant administrative personnel and support. Land banks require significant administrative support if they are to function effectively.
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Source: Horsley and Witten, 1989.

APPENDIX B EXAMPLE: EASTERN TOWNSHIP

IF YOU CONSIDER OVERLAY ZONING FOR YOUR SYSTEM:

COMPARE CURRENT ZONING AND PLANNING DOCUMENTS TO THE WHPA YOU HAVE MAPPED. AS A RESULT OF THIS COMPARISON, IDENTIFY:

- CURRENT ZONING OF CONCERN TO WELLHEAD PROTECTION:

~~All residential districts, except R-1, Rural~~
~~Industrial~~
~~All commercial districts, except C-3 (out of WHPA)~~

- USES OR CONCERN TO WHP THAT ARE ALLOWED BY CURRENT ZONING:

~~A number of uses of concern to WHP are already allowed~~
~~by the current zoning ordinance, e.g. service stations, industry.~~

- SPECIFIC PROVISIONS OF CURRENT ZONING THAT MAY TOUCH ON WHP ISSUES :

~~Zoning Ordinance – section 410, I – Industrial, Paragraphs 410.1.e.2 and 4 touch on~~
~~toxic gases and liquid wastes or sewage, but possible lack the stringency to provide~~
~~effective management of the WHPA.~~

WHPA Version 2.1, Ground Water Protection Division, Office of Ground Water and Drinking Water, U.S. EPA, Washington, D.C.

The WHPA 2.1 model or "WHPA Code" is a modular, semi-analytical, ground water flow model developed for EPA that is designed to assist State and local technical staff with the task of Wellhead Protection Area (WHPA) delineation. The model is designed for PC use and is very user friendly.

The model consists of four independent, semi-analytical modules that may be used to identify the areal extent of ground water contribution to one or multiple pumping wells. One module is a general particle tracking program that may be used as a post-processor for two-dimensional, numerical models of ground water flow. One module incorporates a Monte Carlo approach to investigate the effects of uncertain input parameters on capture zones. Multiple pumping and injection wells may be present and barrier or stream boundary conditions may be investigated. Data input, computational control, and on-screen preview of graphic output is facilitated by a user-friendly, menu-driven interface.

SYSTEM REQUIREMENTS

- | | | |
|-------------------------------------|---|-----------------------|
| • IBM PC, XT, AT or equivalent | • hard drive (with at least 500K unallocated space) | OPTIONAL: |
| • 640K RAM (about 580K free memory) | • DOS 2.1 or higher | • math coprocessor |
| • one disk drive | • CGA graphics | • EGA or VGA graphics |
| | | • laser printer |
| | | • HP7475A plotter |
| | | • dot-matrix printer |

Version 2.1 of the WHPA code is being distributed by the International Ground Water Modeling Center.

To obtain a copy of WHPA 2.1 and the updated user's guide, contact:

International Ground Water Modeling Center
Institute of Ground Water Research and Education
Colorado School of Mines
Golden, CO 80401-1887
(303) 273-3103

The \$50 cost for the code includes a diskette copy of the code, the user's guide, and assistance with code installation.